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L.N. Snimshchikova

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(3)*

New species of the genus Peloscolex (Oligochaeta, Tubificidae) from northern Lake Baikal and their relationship to the earlier known species Peloscolex werestschagini

by L.N. Snimshchikova

Five species of peloscolecids were described earlier [Snimshchikova, 1982]; each of these species has its own distinctive species characteristics, and at the same time shares a number of common features. The discovery of these species has served as the basis for a more thorough study of Lake Baikal peloscolecids. As a result of the further examination of material on N Baikal oligochaetes, we discovered a number of distinctive forms which were morphologically similar to those already described in the literature. The characteristics of three new species of peloscolecids are given below.

The Swedish scientists Ch. Holmquist (1978, 1979) divides the genus Peloscolex into 8 genera. However, V.P. Semernoi (manuscript) does not agree with this type of division and suggests leaving the complex of "testate"** oligochaetes undivided.

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*The numbers in the right-hand margin are the pages of the Russian text - translator

**i.e. having a firm external covering or epidermal thickening - transl.

I agree with V.P. Semernoi, and believe that the motives for dividing the genus Peloscolex into several independent genera are insufficient. The material concerning the Baikal peloscolecids hardly speaks in favour of this type of division.

Peloscolex discolor sp. n. 1 (fig. 1)

D e s c r i p t i o n. Large worms up to 28-30 mm in length, maximum diameter in region of 14-16th segments 2.5-3 mm. Number of segments 60-62. Mature specimens variegated. Preclitellar segments dark brown, colour gradually deepens from cephalic segments (II-III). Papillae on these segments like shiny brown dots, closely spaced but not coalescing with each other. Papillae smaller and more sparsely distributed on first three segments and on ventral side of subsequent segments. Papillae absent around setal tubercles, transverse-elongated light areas form.

Clitellum occupies one-half of segment X and all of segments XI and XII, beige-coloured, with papillae, as is usually the case in peloscolecids, papillae form epidermal thickening on dorsal side, smaller on ventral side, absent around genital openings, forming gaps. Several subsequent segments (XIII-XVII) bright orange, brightest on dorsal side. Bright colour apparently due to secretions, especially abundant in this area, on papillae form large orange spherical-quadrangular nodular deposits which are densely spaced, but do not coalesce. They increase the diameter of the body in such a way that the preclitellar segments are much higher than the clitellar ones. Body colour alternates in subsequent segments (beige, brown and again orange), which makes the mature specimens very attractive and is remotely reminiscent

of the colour manifestation of sexual dimorphism in some animals.

Immature specimens are brown, colour uniform throughout, slightly darker on dorsal side and lighter on ventral side. Papillae smaller at anterior end and on ventral side. Prostomium mostly retracted.

Setal apparatus. Dorsal bundles usually with 3 capillary setae in each (sometimes 2 in segments II-III and up to 5 in segments VI-VII) and 2 acicular ones (sometimes with one in each bundle in segment II). Fine capillary setae smooth, non-plumose, 380 μ long in segment II, and up to 400 μ long in segment III and subsequent segments. Acicular setae very thin and small, 35 μ long in segment II and up to 50 μ long in subsequent segments. Dorsal bundles of postclitellar segments each with 2 capillary setae up to 350 μ long and 2 acicular setae up to 40 μ long.

Ventral setae in all segments single-toothed, curved, with an ental nodule. Bundles of segment II and sometimes segment III each with 3 setae, and bundles of segments III-X each with 2 setae measuring 120 μ in length. In postclitellar segments, ventral setae one to a bundle, thicker and larger than in anterior segments, up to 200 μ long.

Clitellum clearly defined, annular, occupies one-half of segment X and all of segments XI and XII. Spermathecal pores in segment X, atrial pores in segment XI, in line of ventral setae.

Genital apparatus. One pair of spermathecae in segment X. Spermatheca very large, oviform, with a long efferent duct. Length without efferent duct 1200 μ, diameter in widest part

660 μ. Length of efferent duct 1400 μ. Each spermatheca with 2 long narrow spermatozeugmata looped three times in the form of an eight.

One pair of testes in segment X on dissepiment 9/10, one pair of ovaries in segment XI on dissepiment 10/11. Funnels on dissepiment 10/11 open in segment X. Vasa deferentia about 2500 μ long, form several loops. Diameter of vas deferens gradually expands from 36 μ in proximal part to 50 μ in distal part. Vas deferens falls into atrium apically. Prostate gland large, (6)
separate, falls into atrium from the side in its proximal half. Atrium expanded at point of entry of prostate gland, narrows distally, forming two sharp maximal flexures. Atrium ends in soft penis enclosed in well-defined penial sac. Distally acuminate crystal is found along the duct inside the atrium closer to the distal margin. Length of crystal 176 μ, maximum diameter at proximal margin 35 μ. Length of atrium without penial sac 710 μ, diameter at point of entry of prostate gland 156 μ, diameter in region of crystal 140 μ. Length of penial sac about 200 μ, diameter 58 μ.

O c c u r r e n c e. Northern Lake Baikal, Sosnovskaya Banka, depth 270-360 m, dark brown silt, 26 July 1975, 20 specimens (6 mature).

A characteristic feature of this species is the bright tricolour coloration of the test* in mature individuals. Peloscolex discolor is similar to P. malevici [Chekanovskaya, 1975; Snimshchikova, 1982] and P. solitarius [Snimshchikova, 1982] in a number of characteristics of the setal apparatus and the genital

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*or epidermal thickening - transl.

system, i.e. ventral single-toothed setae with an ental nodule, acicular (simple-acuminate) setae in the dorsal bundles, a long separate efferent duct of the spermatheca, vasa deferentia which widen gradually from the funnel and fall into the atrium apically, the point of entry of the prostate gland into the atrium, a structurally similar form of the atria and the presence of crystals in their distal part.

P. discolor and P. malevici differ in body dimensions, the structure of the test, the number of capillary setae (non-plumose in the described species) and acicular setae in the dorsal bundles, the form of the spermathecal ampulla (spheroidal in P. malevici and oviform in P. discolor), the form of the atrium (cylindrical in P. malevici and narrowing distally and highly curved in P. discolor), and in the form of the crystal (straight in P. malevici and distally acuminate in P. discolor).

P. discolor and P. solitarius differ in the plumosity of the capillary setae (plumose in P. solitarius and smooth, non-plumose in P. giganticus), the form of the spermathecal ampulla (saccate in P. solitarius and oviform in P. discolor), the structure of the distal end of the atrium (less curved in P. solitarius), and the presence of a single crystal inside the atrium in P. discolor and a group of crystals in the flexure of the atrium from the outside in P. solitarius.

Peloscolex bekmani sp. n. (Fig. 2)

D e s c r i p t i o n. Length of body 8-10 mm, maximum diameter 1.2 mm. Number of segments 58-62. In most cases, anterior region of body expanded, in some specimens diameter of

(7)

body increases gradually, inflations of anterior segments absent. Colour light brown to dark brown. Body surface covered with fairly large papillae with particles of silt and sand stuck to the secretion.

The test is thin, transparent and finely plicate, 8-10 folds bearing rows of papillae in each segment. Anterior segments lighter, as the papillae on them are small and widely spaced; in postlarval segments, papillae larger, closely spaced, and so the colour appears darker; size and number of papillae again diminish in caudal segments.

Setal apparatus. Dorsal bundles of segments II-IV each with 4-5 capillary setae up to 200 μ long and 4-5 flabellate setae up to 70 μ long. Number of dorsal setae in bundles of subsequent segments decreases to 3 capillary and 3 flabellate ones. Beginning with segment VII, each dorsal bundle contains 2 capillary and 2 flabellate setae. Length of capillary setae of segments V-VIII up to 300 μ, length of flabellate setae up to 100 μ. Postlarval segments each with 2 capillary setae up to 170 μ long and 2 flabellate setae up to 30 μ long. Capillary setae plumose. Marginal teeth of flabellate setae of equal length, interjacent denticles barely discernible with 7x90 magnification.

Ventral bundles of segments II-IV or II-V each with 2 setae. Segment II may be with 3 setae to a bundle. Beginning with segment V (sometimes segment VI), ventral bundles contain only one seta each. From segment IX (sometimes segment VIII), ventral setae absent in segments X-XV and reappear in segments XX-XXV.

(8)

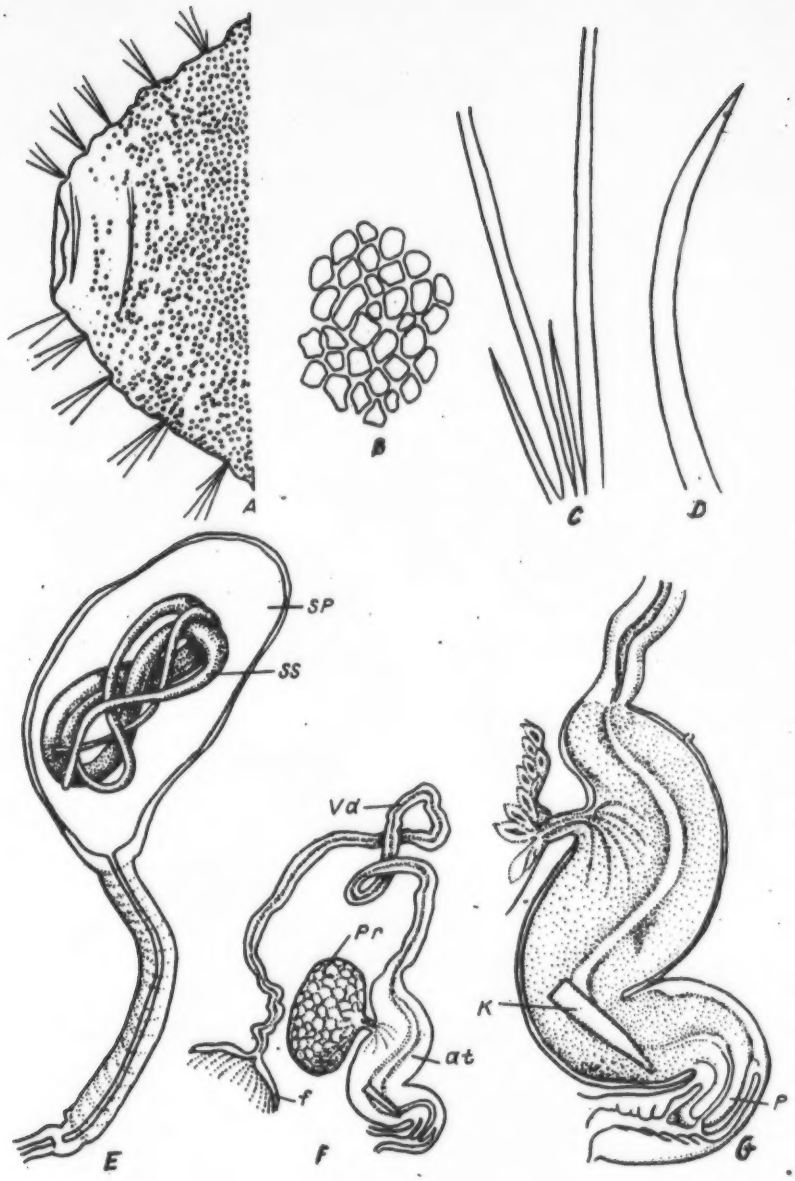

Fig. 1. Peloscolex discolor sp. n.

A - general view of anterior end (oc 7 x obj 3.5); B - papillae with hardened secretion on postclitellar segments (oc 7 x obj 3.5); C - distal ends of acicular setae and fragments of capillary setae (oc 7 x obj 40); D - distal end of ventral seta (oc 7 x obj 40); E - spermatheca SP with spermatozeugmata SS (oc 7 x obj 3.5); F - male gonoduct (oc 7 x obj 3.5): f - seminal funnel, Vd - vas deferens, at - atrium, Pr - prostate gland; G - distal (copulatory) region of male gonoduct (oc 7 x obj 9): p - penis in penial sac, k - crystal

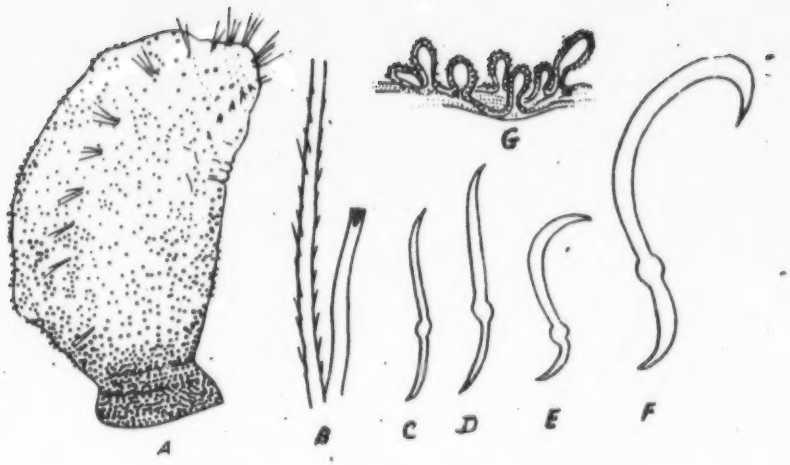

Fig. 2. Peloscolex bekmani sp. n.

A - general view of anterior end (oc 7 x obj 3.5); B - distal end of flabellate seta and fragment of capillary seta of segment II (oc 7 x 90); C - ventral seta of segment II (oc 7 x obj 40); D - ventral seta of segment IV (oc 7 x obj 40); E - ventral seta of segment VIII (oc 7 x obj 40); F - ventral seta of segment XXII (oc 7 x obj 40); G - papillae in region of segment IX (oc 7 x obj 40)

All ventral setae single-toothed with ental nodule, in anterior segments thin, very weakly curved, 100-110 μ long. From segment V, setae gradually thicken and their curvature increases.

Segments without setae (beginning with segments XX-XXV), followed by solitary large setae up to 160 μ high and falciform, which are observed up to the end of the body.

Genital apparatus. The dissected worms proved to be immature. Only one specimen was found to have a spermatheca with spermatozeugmata. The rest of the organs had undergone resorption. The spermatheca has an oviform ampulla and a well-defined, short efferent duct. Length of spermathecal ampulla 280 μ, diameter 140 μ. Length of efferent duct 50 μ. Spermatheca contains two long and narrow spermatozeugmata looped in the form of an eight.

Unfortunately, the absence of mature specimens did not enable us to describe the species in full, but the external features greatly distinguish it from all the peloscolecids known up to the present time. The remarkable feature is that the new species does not have ventral setae on more than ten segments in the middle part of the body, and also has a distinctive form of falcate setae on the caudal segments. However, the following features make the structure of the setal apparatus of the anterior segments similar in P. bekmani and P. malevici [Chekanovskaya, 1979; Snimshchikova, 1982]: the ventral single-toothed setae have an ental nodule and are distributed 2 to a bundle in segments II-V and one to a bundle in segments V-IX. P. malevici does not have the same large falciform setae as P. bekmani, but they are present in another Baikal species, P. falcatus [Snimshchikova, 1982], in which exactly the same kind of falcate setae are found in the ventral bundles of all the segments. Thus, the distribution of the setae and their structure in the anterior segments makes P. bekmani similar to P. malevici, and the form of the setae in the caudal segments makes it similar to P. falcatus.

Differences in the structure of the dorsal setae of these three species are also characteristic. The dorsal bundles in P. malevici contain acicular (simple-acuminate) setae; in P. falcatus, the distal end of the acicular setae is not pointed, but has two reduced teeth ; the dorsal bundles in P. bekmani contain flabellate setae with marginal teeth of different length and with minute interjacent denticles.

O c c u r r e n c e. N Baikal, Yarki Is., depth 10-20 m, 1 and 24 July 1977, 13 Aug and 12 Sept 1976; Cape Ireksokon, depth 10-12 m, 16 Sept 1976. Thirty-two specimens in all, immature.

The species is named after Margaret Yu. Bekman, a researcher of the Limnological Institute. (9)

Perhaps Peloscolex bekmani and P. falcatus, which have been described on the basis of their external features alone, do belong to the same group of the Baikal complex as P. malevici. Future finds of mature specimens of these two species and a study of their genital system may possibly confirm this assumption.

Peloscolex paradoxus sp. n. (Fig. 3)

D e s c r i p t i o n. Length of body 24 mm, maximum diameter in region of segment XII 2 mm. Number of segments 72. Colour light brown to dark brown, anterior segments usually lighter. Closely spaced papillae form a continuous test. Structure of papillae clearly seen on segments II-IV (Fig. 3, F). Small soil particles stuck to them at the top form dark wavy bands in the folds of the test; these bands encircle the body of the worm, several rings to a segment. Segment II biannular, anterior ring almost twice as wide as posterior ring, segments III and IV triannular, anterior ring twice as wide as the other two which are of the same width. Beginning with segment V, width of rings equalizes, rings gradually narrow, their number increases to 10-12 in each segment. Anterior segments wide, at end of body highly compressed.

Large, light-coloured, spherical setal tubercles (Fig. 3, G) stand out and rise above the dark background of the test; tubercles distributed 4 to a segment near the dorsal and ventral setae and form 4 longitudinal rows, 2 dorsolateral and 2 ventrolateral ones. Apparently, these are the same kind of glands that were noted by O.V. Chekanovskaya (1975) in her description of Pelo-scolex malevici, except that they are much larger. Their origin is not clear.

Setal apparatus. The ventral bundles of segment II each contain one single-toothed and two forked setae, and those of segment III and subsequent preclitellar segments each contain one single-toothed and one forked seta, the single-toothed ones located ventrally (internal) and the forked ones laterally (external). Forked setae either with teeth of equal length, or with a rudimentary distal tooth. Length of ventral setae of preclitellar segments 180-210 μ. Postclitellar segments with one seta to a bundle, seta stronger than preclitellar ones, S-shaped, with rudimentary distal tooth and a short proximal tooth, length of setae 140 μ.

Dorsal bundles of preclitellar segments each contain 2-3 capillary plumose setae and 2-3 flabellate setae with teeth of equal length and with small, very thin interjacent denticles. Length of capillary setae 350-420 μ, length of flabellate setae 80-120 μ. Dorsal bundles of postclitellar segments each contain (11)
one capillary plumose seta 170-180 μ long and one very small and thin acicular seta 70 μ long. The capillary setae of the caudal segments have an unusual appearance; so much organic matter

is stuck to or grown onto them that the seta itself cannot be seen, and one can only assume that it is a capillary seta. The acicular setae of the caudal segments are very small.

Genital apparatus. Clitellum light-coloured, annular, occupies segments X-XII. Spermathecal pores in segment X and atrial pores in segment XI are distributed in the line of ventral setae.

Spermathecae in segment X with spheroidal ampullae and long separate efferent ducts. Length of spermathecal ampulla 350 μ, diameter 320 μ. Length of efferent duct of spermatheca 460 μ, diameter 85 μ. Spermatozeugmata not observed, spermathecae were probably at the development stage.

Funnels on dissepiment 10/11 open in segment X. Vasa deferentia narrow and looped in proximal part, gradually widen from 30 μ to 42 μ in distal part, fall into atrium apically. Length of vas deferens about 2150 μ. Prostate gland large, compact, falls into atrium from the side, almost in the middle.

Atrium elongated, narrows proximally and distally, at distal end forms two sharp maximal flexures and ends in a soft penis enclosed in a penial sac. A solitary rectangular crystal is found along the duct inside the atrium, in its distal half. Length of crystal 150 μ, diameter 17 μ. Length of atrium without penial sac 500 μ, diameter of atrium 110 μ. Length of penial sac 175 μ, diameter 52 μ.

Description based on one mature specimen (holotype) from the collection of the Limnological Institute.

O c c u r r e n c e. N Baikal, Yarki Is., depth 10 m, fine silty sand, 12 Sept 1976.

Immature specimens of this species are encountered very frequently, almost in all of our samples. However, no other mature specimens have been found. In the structure of the setal apparatus, they are similar to Peloscolex velutinus (Grube, 1879); they have the same ventral setae, single-toothed and forked with teeth of equal length or with a rudimentary distal tooth, and the same dorsal setae, capillary and flabellate with marginal teeth of equal length. However, all of its genital characteristics indicate that it belongs to the group of peloscolecids of the Baikal complex. It is most similar to Peloscolex exilis [Snimshchikova, 1982], P. cristatus [Snimshchikova, 1982] and P. malevici [Chekanovskaya, 1975; Snimshchikova, 1982] not only in the structure of the genital apparatus, but also in a number of structural characteristics and the distribution of the ventral setae.

(12)

After finding a mature peloscolecid with a "velutinus"-type setal apparatus and a genital apparatus typical of the whole group of N Baikal peloscolecids, we naturally wished to examine the internal structure of other, long-known Baikal peloscolecids, e.g. P. werestschagini which is not encountered in N Baikal. M.Yu. Bekman kindly supplied us with 28 specimens of P. werestschagini from S Baikal. This species proved to have the same type of genital system. This prompted us to check the data on the structure of the setal apparatus. After the test had been removed with the setae kept intact under it and we could get a good look at the structure of the epidermal glands, we were able to examine the features which could not be seen under the thick test by Michaelsen who described P. werestschagini in 1933 on the basis of one specimen. We have added to this description.

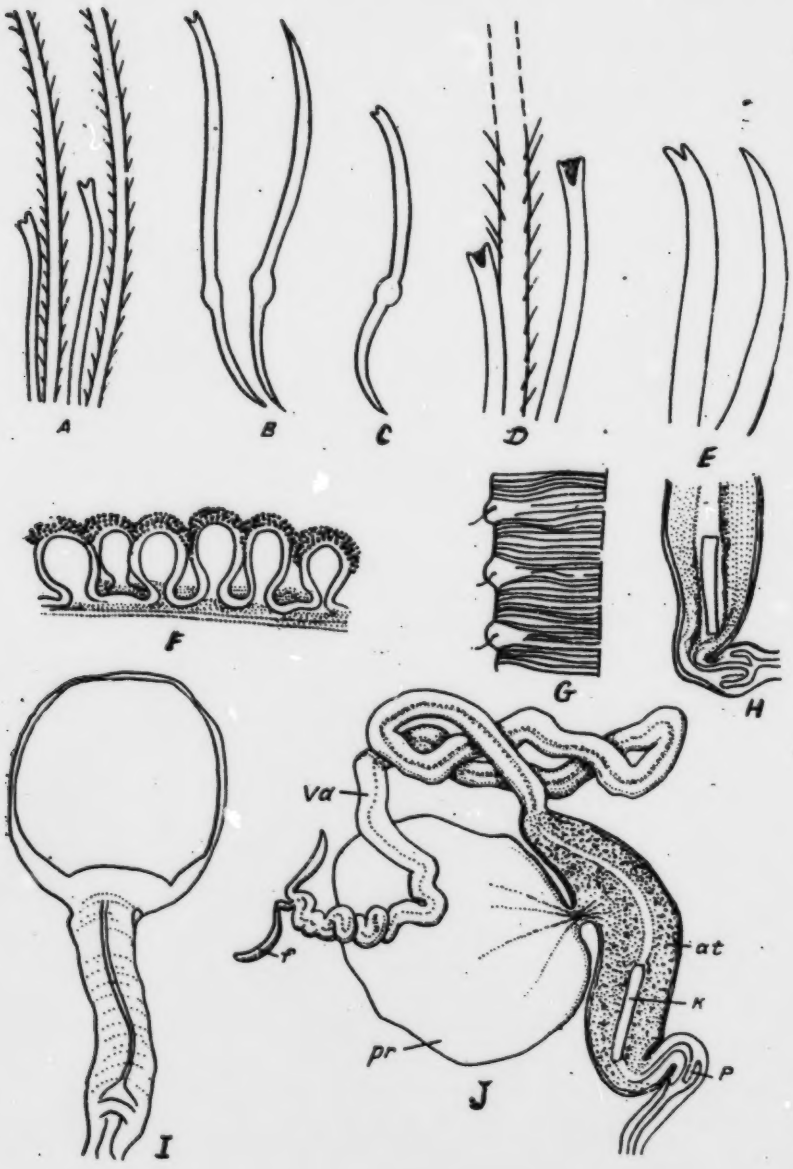

Fig. 3. Peloscolex paradocsus sp. n.

A - flabellate setae and fragments of capillary setae of segment V (oc 7 x obj 40); B - ventral setae of segment III (oc 7 x obj 40); C - ventral seta of segment XIV (oc 7 x obj 40); D - magnified flabellate setae and fragments of capillary setae of segment V (oc 7 x obj 90); E - magnified ventral setae of segment II (oc 7 x obj 90); F - papillae with soil particles stuck to them in region of segment IV (oc 7 x obj 40); G - setal tubercles in region of segments XVI, XVII and XVIII (oc 7 x obj 3.5); H - distal end of paired atrium with crystal (oc 7 x obj 10); I - spermatheca (oc 7 x obj 10); J - male gonoduct (oc 7 x obj 10). Nomenclature as in fig. 1.

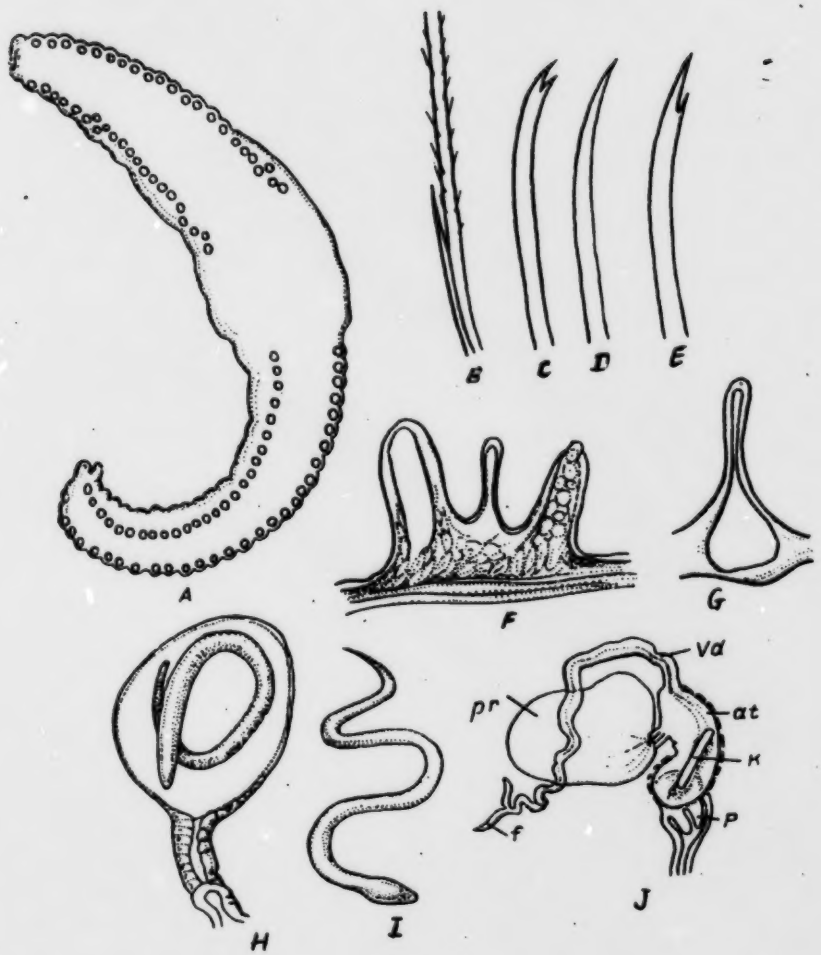

Fig. 4. Peloscolex werestschagini Michaelsen

A - external appearance; B - distal end of acicular seta and fragment of capillary seta (oc 7 x obj 90); C - distal end of ventral forked seta of segment III (oc 7 x obj 90); D - distal end of ventral single-toothed seta of segment III (oc 7 x obj 90); E - distal end of ventral seta of postclitellar segments (oc 7 x obj 90); F - papillae, test removed (oc 7 x obj 40); G - ampullaceous papilla (oc 7 x obj 90); H - spermatheca (oc 7 x obj 9); I - spermatozeugata (oc 7 x obj 9); J - male gonoduct (oc 7 x obj 9). Nomenclature as in fig. 1.

Peloscolex werestschagini Michaelsen (Fig. 4)

D e s c r i p t i o n. Length of body 3.1-3.5 mm, maximum diameter 0.5 mm, number of segments 26-29. Body spherical-quadrangular, expanded in the middle, Prostomium retracted. Surface of body covered with thick test formed from fused epidermal papillae. Large glands in the line of ventral and dorsal setae (which Michaelsen calls sensory tubercles) form 4 longitudinal rows along the entire length of the body, 2 dorsolateral and 2 ventrolateral rows, which gives the body a tetrahedral appearance. There are no sensory tubercles in the region of the clitellum.

Setal apparatus. Ventral bundles of preclitellar segments (II-X) each contain 2 setae with an ental nodule - one ventral (internal) single-toothed seta and one forked seta with the distal tooth twice as long as the proximal lateral (external) one. Length of ventral setae 83 μ in segments II-III and 100 μ in segments IV-VIII.

In postclitellar segments, ventral setae one to a bundle, forked with rudimentary proximal tooth, almost twice as large as setae of anterior segments, 150 μ long.

Dorsal bundles each with one capillary plumose seta (rarely 2) 250 μ long, and one very fine and minute acicular seta 50 μ long; the second one could be seen only when the test had been removed. Epidermal glands of two types - large high ones up to 60 μ, which are often filled with secretory cells, and ampullaceous empty ones 33 μ high. Their cellular structure is shown in Fig. 4, F and G.

Genital apparatus. Clitellum annular, occupies segments X-XII. Epidermal thickening (test) on the clitellar portion thinner, no large glands in this region. Spermathecal pores in segment X and atrial pores in segment XI in the line of ventral setae. (13) One pair of spermathecae in segment X, consist of oviform ampulla 284 μ long and 230 μ in diameter, and a separate efferent duct 210 μ long. Two spermatozeugmata in each spermatheca comparatively short, curled up in a ring or serpentine with expanded anterior end. (14)

Funnels on dissepiment 10/11 open in segment X and pass into vasa deferentia, diameter of which is 17 μ in proximal part and gradually expands to 28 μ in distal part.

Length of vas deferens about 520 μ, falls into atrium apically. Prostate gland compact, large, spherical, falls into atrium from the side in proximal half.

Atrium cylindrical, curved in middle at almost 90° angle, ends in wide soft penis enclosed in penial sac, distal end curved in opposite direction. Atrium contains crystal with parallel sides and distally pointed like a pencil, 105 μ long. Length of atrium without penial sac 190 μ, diameter 70 μ. Length of penial sac 60 μ.

P. werestschagini has a distinctive external appearance - a short tetrahedral body, crescent-shaped, covered with a thick light-coloured epidermal thickening with four longitudinal rows of large glands. Of all the N Baikal peloscolecids, P. cristatus is the most similar to it in the structure of the body and setal apparatus. Another similarity is the small size of the short

crescent-shaped body and the main structural features of the genital system. However, the differences of these two species are quite significant. The epidermal thickening of P. werestschagini is covered with small epidermal papillae; in P. cristatus, they are large, especially on the longitudinal dorsal line where they form a high row in the form of a crest. The four longitudinal rows of sensory tubercles are absent in P. cristatus. There are some differences in the structure of the genital apparatus, but they are insignificant.

In the structure and distribution of the setae, P. werestchagini is also similar to P. exilis and P. paradoxus (2 setae in each ventral bundle, one internal single-toothed one and one external forked seta, and the bundles in the postclitellar segments with one forked seta each). P. paradoxus also has four longitudinal rows of large glands similar in structure to those of P. malevici. Perhaps these glands are of the same origin as the sensory tubercles of P. werestschagini.

Therefore, we have established in the structure of the setal apparatus and genital system of P. werestschagini features common to the peloscolecids of the N Baikal group, characteristics which at first had not been regarded as significant, i.e. the consistent distribution of the setae in the ventral bundles and the presence of a crystal inside the main determinative organ (atrium).

We still question the distribution in the open Baikal of the palearctic species Peloscolex velutinus (Grube, 1879) which was first indicated for Lake Baikal by Michaelsen [Michaelsen, Vereshchagin, 1930]. With external features similar to the palearctic

P. velutinus, the Baikal peloscolecid belongs with respect to its internal structure to the same group of the Baikal complex as P. werestschagini. This is apparently a case of convergence which resulted in incorrect assumptions regarding the significance of the palearctic form of P. velutinus in the oligochaete fauna of Lake Baikal. P. velutinus was found even at a depth of 500 m [Chekanovskaya, 1975]. This was most probably a Baikal endemic, a representative of the above-described group of closely related species, which includes P. malevici, P. exilis, P. cristatus, P. werestschagini, P. paradoxus, P. discolor and P. solitarius. According to our assumptions, this group should include P. falcatus, P. bekmani and the recently described Baicalodrilus digitatus [Holmquist, 1978]. We propose that this group of peloscolecids be established as the subgenus crystallifer (crystal-bearing) of the genus Peloscolex. (15)

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